SEMESTER EXAMINATION DECEMBER-2024

Course Name: - B.Tech. (ECE) **Semester:- 3rd**

Paper Name: - Electronics Device **Paper Code:- TEC-301**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-70**

समय– 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं सह लेखक परीक्षार्थियों के लिए। अधिकतम अंक–70

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries **3 mark. All questions are compulsory.**
- Section B- Answer any **5 out of 7** given questions in maximum one hundred fifty (150) words. Each question carries **7 marks.**
- Section C- Answer any **2 out of 3** given questions in maximum three hundred (300) words. Each question carries **10 marks.**

निर्देश:

- प्रश्न पत्र मे तीन खण्ड अ, ब, व स हैं। सभी खण्ड अनिवार्य हैं।
- खण्ड–अ मे प्रत्येक प्रश्न तीन अंक का है। **सभी प्रश्न अनिवार्य हैं।**
- खण्ड–ब में सात प्रश्नों में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें। प्रत्येक प्रश्न सात अंक का है।
- खण्ड–स में तीन प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर अधिकतम (250-300) शब्दों में दें। प्रत्येक प्रश्न **10** अंक का है।

Section – A (खण्ड–अ)

Objective Questions (वस्तुनिष्ठ प्रश्न)

5x3 =15

1. Answer all the following questions.
निम्नलिखित सभी प्रश्न अनिवार्य हैं।

i) Which of the following is correct about NMOS electronic circuits?
   a) For inversion positive voltage is applied to the gate terminal
   b) It has N-substrate
   c) For accumulation positive voltage is applied to the gate terminal
   d) NMOS has holes as the majority of carriers

ii) What is the effect of temperature on the recombination rate of electrons in electronic circuits?
   a) Recombination rate increases with increase in the temperature
   b) Recombination rate decreases with increase in the temperature
   c) Recombination rate is independent of temperature
   d) Recombination of electrons doesn't occur in semiconductors

iii) Which type of semiconductor is used in Tunnel Diode?
   a) Compound semiconductor
   b) Elemental semiconductor
   c) Degenerated semiconductor
   d) Extrinsic semiconductor

iv) Which of the following effects is responsible for violating the mass action law in degenerative type semiconductor electronic devices?
   a) Electronic drift effect
   b) Lattice vibration effect
   c) Thermal effect
   d) Bandgap narrowing effect

v) Which of the following is wrong about P-N junction diodes used in electronic devices?
   a) They have three modes of operations
   b) They have dynamic resistance at low-frequency AC voltage
   c) They have diffusion capacitance at high-frequency AC voltage
   d) They can act as ON-OFF switches

Section – B (खण्ड–ब)
Short Answer Questions (लघुउत्तरीय प्रश्न)

2. Answer any five of the following questions in maximum 150 words. 5x7=35
निम्नलिखित में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें।

i. Explain the action of P-N junction diode under forward & reverse bias, draw & explain the V-I characteristics of P-N junction

ii. Explain the quantum mechanism & K-E diagram?

iii. Discuss about the common-base, common-collector configurations of BJT with their input and output characteristics.

iv. Explain the operation of n-channel JFET with neat diagram. Also sketch its drain and transfer characteristics. Define pinch-off voltage.

v. Explain the Emers-Moll model & C-MOS transistor.

vi. A diode operating at 300K has forward voltage 0.4 V across it when the current through it is 10 mA and 0.42V when the current is twice as large. What value of I0 and η allow the diode to be modelled by the diode equation?

vii. Explain the P-type Semiconductor & N-type Semiconductor.

Section – C (खण्ड–स)
Descriptive Questions (विवरणात्मक प्रश्न)

3. Answer any two of the following question in maximum 300 words. 2x10=20
निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर अधिकतम 300 शब्दों में दें।

i) Explain the operation of n-channel enhancement MOSFET with neat diagram. Also draw its drain and transfer characteristics.

ii) For an N- channel JFET has a pinch off voltage of -4.5V and I_{DSS}=9ma. At what value of V_{GS} will I_{DS} be equal to 3mA? what is its gm at this I_{DS}?

iii) Explain the working of the following:
(a) LED
(b) Solar cell
(c) Zener diode

Mid Semester -Sessional Examination 2024

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Section – D
Objective Questions

1. Answer all the following questions 10×2 = 20

(i) Which of the following is not a property of semiconductors used in electronic devices?
a. They don't emit light
b. hey excite electrons
c. They have high thermal conductivity
d. They have variable electrical conductivity

(ii) What is the effect of temperature on the recombination rate of electrons in electronic circuits?
a. Recombination rate increases with increase in the temperature
b. Recombination rate decreases with increase in the temperature

c. Recombination rate is independent of temperature
d. Recombination of electrons doesn't occur in semiconductors

(iii) Which of the following is correct about semiconductors in electronic devices?

a. Elemental semiconductors have direct band gap
b. Compound semiconductors have indirect band gap
c. Extrinsic semiconductors are injected with impurities
d. Doping is done in Intrinsic semiconductors

(iv) Which of the following is correct about Hall Effect in electronic circuits?
a. Hall voltage is directly proportional to the charge density
b. Hall voltage is inversely proportional to the intensity of the magnetic field
c. Intrinsic semiconductor has a positive temperature coefficient of hall constant
d. Hall voltage is very weak in metals as compared to semiconductors

(v) Which of the following is correct about NMOS electronic circuits?
a. For inversion positive voltage is applied to the gate terminal
b. It has N-substrate
c. For accumulation positive voltage is applied to the gate terminal
d. NMOS has holes as the majority of carriers

(vi) On the drain characteristic curve of a JFET for $V_{GS} = 0$, the pinch-off voltage is
a. below the ohmic area.
b. between the ohmic area and the constant current area.
c. between the constant current area and the breakdown region.
d. above the breakdown region

(vii) The output characteristics of a MOSFET, is a plot of

a. Id as a function of Vgs with Vds as a parameter
b. Ig as a function of Vgs with Vds as a parameter
c. Id as a function of Vds with Vgs as a parameter
d. Ig as a function of Vds with Vgs as a parameter

(viii) When the voltage across the zener diode increases_____
a. temperature remains constant and crystal ions vibrate with large amplitudes
b. temperature remains constant and crystal ions vibrate with smaller amplitudes
c. temperature decreases and crystal ions vibrate with large amplitudes
d. temperature increases and crystal ions vibrate with large amplitudes

(ix) Avalanche breakdown in zener diode is _____
a. electric current multiplication takes place
b. phenomenon of voltage multiplication takes place
c. electrons are decelerated for a period of time
d. sudden rise in voltage takes place.

(x) Which of the below is widely used, in the application of Zener diodes?
a. Series regulator
b. Shunt regulator
c. Rectifiers
d. Clamper